PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A23L 1/236 — A1

(11) International Publication Number: **WO 98/04156**

(43) International Publication Date: 5 February 1998 (05.02.98)

(21) International Application Number: PCT/US97/13526

(22) International Filing Date: 25 July 1997 (25.07.97)

(30) Priority Data:
08/687,894 26 July 1996 (26.07.96) US

(71)(72) Applicant and Inventor: BATEMAN, Kristine, A. [US/US]; 243 West Main Street, Rigby, ID 83442 (US).

(74) Agents: DE GROOT, Robert, A. et al.; Hopkins Roden Crockett Hansen & Hoopes, PLLC, P.O. Box 51219, Idaho Falls, ID 83405-1219 (US).

(81) Designated States: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, HU, IL, IS, JP, KE, KP, KR, KZ, LC, LK, LR, LT, LV, MG, MK, MN, MW, MX, NO, NZ, PL, RO, SD, SG, SI, SK, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: DIETETIC ONE-TO-ONE SUGAR SUBSTITUTE COMPOSITION FOR TABLE TOP, BAKING AND COOKING APPLICATIONS

(57) Abstract

A low calorie, diabetic safe, water soluble, tooth friendly, synergistic sweetening composition containing intense sweeteners; bulk sweeteners; a small amount of simple sugar sweeteners to help with the browning of the baked food products; anti-flatulent agents used to help to break up the gas created as the polysaccharides metabolized by the intestinal microflora; and flavoring agents. The present invention is very stable under processing conditions including heat, pH, and moisture. The composition is a one-to-one substitution for granulated sugars, brown sugars, and powdered sugars. The sweetening composition can be used in all types of "ingestible food". These ingestible foods retain their sweetness, appearance, texture and good taste when compared to food preparations made with regular granulated, brown and powdered sugar.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

DIETETIC ONE-TO-ONE SUGAR SUBSTITUTE COMPOSITION FOR TABLE TOP, BAKING AND COOKING APPLICATIONS

TECHNICAL FIELD

This application claims priority from U.S. application serial number 08/687,894 filed July 26, 1996, and currently pending with the U.S. Patent Office.

This invention is for one-to-one sugar replacement compositions that can replace granulated sugars, brown sugars and powdered sugars.

BACKGROUND OF THE INVENTION

The need to control weight because of obesity and other health relate problems are well known. Common sugar (sucrose) has four calories per gram and is associated in foods that are typically high in calories. Sugar is probably the most important ingredient in the confectionery and baking industry with fat being a close second. Consumers with endocrine disorders such as diabetes mellitus are advised to follow a strict diet staying away from sugar and to eat low fat. Diabetes is often controlled by a diet, and two aspects are of significant importance: 1) control of intake of carbohydrates influencing the blood glucose and insulin levels, and 2) control of the total calorie intake. In the past, the consumer who had to eat sugar free foods had to limit their diet to include only foods that were naturally low in sugar or to use the intense sweeteners and other sugar sweeteners available in the marketplace. The desire for a diabetic individual to be able to bake, cook and eat foods normally high in sugar such as rich bakery products is well known. However, these rich baked foods have been prohibited because of the high amount of sugar and fat that they contain. A "diabetic safe" sweetener is a sweetening agent that when ingested by a diabetic person does not significantly

raise their glucose and insulin levels in the blood. The search for a low calorie, diabetic safe sugar replacement used in these types of food products has been illusive.

Applicant defines the term "ingestible" to include all ingredients and compositions which are used by or which perform a function in the body. These include ingredients and compositions which are absorbed and those which are not absorbed as well as those that are digested and not digested. Applicant defines the term "low calorie" to mean ½ the calories or less of the ingestible food it is substituting. The present invention has ½ the calories or less of sucrose. "One-to-one" substitution is the term used to replace an ingredient in ingestible foods with the same amount of another ingredient used to replace it. This substitution is either in weight measurement or volume measurement--for example, cup for cup, pound for pound, etc. The term "natural' is meant to mean to exist or caused by nature. Example, an ingredient can be naturally found in plants. Applicant defines the term "water soluble" to mean the amount of that particular ingredient that will go into a solution in water and as the temperature of the water rises, the amount of the ingredient capable of being dissolved in a given amount of water also increases. "Bulk sweeteners" can include both polysaccharides and oligosaccharides. "Polysaccharide" is defined as a carbohydrate containing eleven or more saccharide units joined with the elimination of a molecule of water at each point of linkage. "Oligosaccharide" is defined as a carbohydrate consisting of two to ten monosaccharides joined by the elimination of water. It is smaller than a polysaccharide and less prominent in foods.

A variety of intense sweeteners have been available to the consumer to be used in ingestible food compositions. However, the intense sweeteners available have been lacking in several aspects. First, they have lacked the bulk necessary to substitute in a one-to-one basis in recipes. If a cup of sugar was taken out of a cake recipe and replaced by a small amount

of intense sweetener or at best, partial bulk of the original sugar, the cake simply did not turn out with a comparable texture, taste, appearance or overall appeal of the regular sugar cake. In the past the intense sweeteners and bulk sweeteners could only be used successfully if each ingestible food product was altered and adjusted to compensate for the loss of bulk in a recipe. The novice cook was unable to do such alterations on every recipe and in all types of foods. Even in the commercial field today, each recipe has to be adjusted with a variety of bulk sweeteners and intense sweeteners. Usually the sweeteners, both bulk and intense, are changed with each type of food or recipe. It is the common practice of making one recipe or food preparation low calorie. This makes the sweeteners or sweetening compositions very limiting in their use. There have been no suitable sweetening compositions that could be used in all types of foods as a complete sugar replacement and under all types of use including table top use, baking, cooking, and mixing situations.

Second, most of the intense sweeteners available lose their sweetness under heat. Aspartame is a water soluble, dipeptide intense sweetener 200 times sweeter than sugar. It is a protein made from the natural amino acids L-aspartic acid and L-phenylalanine and is digested like any other protein and is fully metabolized by the body. Because aspartame's sweetening power is so intense, only small amounts are needed for most applications. A similar product has been marketed under the name of Nutritsweet and it states on its label that it is not recommended to be used under heat and baking conditions, and if possible add the aspartame after cooking. This intense sweetener is very unstable under heat, pH conditions (including aldehydes), ketones of cinnamon flavor and moisture. Many patents have been issued in the pursuit of making this dipeptide sweetener more stable. The encapsulating of aspartame is one of the more popular versions. In this encapsulation aspartame is usually

covered in a wax, fat or other coating after being prepared in several manners. U.S. Patent No. 5,043,169 is one such aspartame encapsulating patent. This patent is the tableting process of a composition including aspartame, carbohydrates including polydextrose. Additional sweeteners may be chosen from the following non-limiting lists: sugars, such as glucose (corn syrup), sucrose, dextrose, invert sugar, fructose, aspartame, non-fermentable sugar substitutes, and acesulfame-K. Again the combination of these ingredients is not meant to be a sugar substitute to be used in baking and cooking. The tendency now is to use aspartame in the foods and drinks that do not experience the heat, moisture and change of pH. Also, many times aspartame is added to an ingestible food or drink with other more stable intense and bulk sweeteners on an individual recipe basis. Public approval seems to be shifting to the negative perception of the use aspartame. Many consumers claim to stay away from foods containing it because of the rumors heard. When used in the present invention, the level of aspartame is kept low because of the synergistic effect between the intense sweeteners and the bulking sweeteners and agents. The amount used is lower than if used by itself.

Acesulfame-K is a known stable intense sweetener that is also 200 times sweeter than sugar, water soluble, tooth friendly and diabetic safe which has been used in many food products. It is not metabolized and therefore, non-caloric. It has been known for its strong bitter taste. U.S. Patent No. 5,106,632 assigned to Warner-Lambert Company discloses an acesulfame-K containing composition used in sour chewing gum exhibiting enhanced sweetness having one or more food grade acids, including acesulfame-K and potassium chloride. They claim the composition can be used in edible food such as a cake, cookie, or other baked products, but again would have to be adjusted for every recipe because of lack in bulk and sweetness. In this patent it is definitely not a one-to-one replacement for 100% of the sugar.

In U.S. Patent No. 4,382,963, Klose discloses a sugar free, low calorie chewing gum utilizing spray dried polydextrose as the bulking agent and sweetening with either fructose, aspartame, sugar alcohols, or acesulfame-K, etc. U.S. Patent No. 4,983,405 is another patent issued in the goal of making low calorie and sugar free gums using intense sweeteners, bulk sweeteners, fructose, and glucose (corn syrup), etc. U.S. Patent No. 5,342,631, assigned to Wm. Wrigley Jr. Co., discloses a patent for use in some petroleum wax-free gums using high intensity sweeteners represented by, but not limited to sucralose, aspartame, stevioside, acesulfame-K, alitame, saccharin and its salts, cyclamic acid and its salts, glycyrrhizin, dihydrochalcones, thaumatin, monellin, and the like. It also includes non-cariogenic oligosaccharides, and flavors. This patent specifies using these combinations of ingredients in the petroleum wax-free gum only. U.S. Patent No. 5,098,730 by Tammy Pepper discloses a reduced calorie, non-carcinogenic sweetener of xylitol and a reduced calorie bulking agent. Acesulfame-K is listed as a possible intense sweetener that could possibly be added to the invention. Additionally, several prior patents have disclosed a synergistic action between other groups of intense sweeteners such as a cesulfame-K. The U.S. Patent No. 4,495,170 provides synergistic compositions containing a mixture of sweetening agents; the list includes saccharine, steviodise, acesulfame-K or other bitter tasting sweetening agents, with at least one sweet chlorodeoxysugar sweetener selected from the group consisting of chlorodeoxysucrose and chlorodeoxygalactosucdrose.

The criterion of finding natural intense sweeteners is also lacking in the above patents. The goal of being able to make a natural sweetening composition has been very difficult using the intense sweeteners on the market. One natural intense sweetener is thaumatin, the sweetest natural substance known to man, the brand name being Talin. The protein thaumatin is found

in the Katemfe plant of Thaumatococcus Daniellii grown in the hot humid forests of West Africa. The formulation with gum arabic helps make it more stable in use with colors, fruit juices, and with its tendency to interact with xanthin gum, pectin, carboxymethyl cellulose, carrageenan, guar gum, locust bean gum or alginate under higher temperatures. Prior art using thaumatin or talin as an intense sweetener includes U.S. Patent No. 4,983,405, A REDUCED AND LOW CALORIE SUGAR AND SUGARLESS CHEWING GUM COMPOSITIONS CONTAINING FIBER. It lists Talin as one of the group that can be used as the sweetener in chewing gum. U.S. Patent No. 5,342,631 also lists the use of thaumatin or Talin as one of the high intensity sweeteners that can be used in the petroleum wax-free chewing gum. U.S. Patent No. 5,059,428, Synergistic Sweetening Compositions Containing Polydextrose and a Chlorodexoxysugar and Methods for Preparing Same discloses possibly using talin as an intense sweetener in gum and in a sweetening composition with limited applications.

Another natural intense sweetener not approved yet by FDA in the U.S. at the present time is alitame. It is heat stable and 2000-3000 times sweeter than sucrose with no aftertaste. It is very stable under heat, pH, moisture and strong flavors.

The goal of making this invention as close to all natural as possible was important. The bulking ingredients in our preferred formula's 1 and 1A are all natural. This invention is to be used as a tool for those groups of people that have the need this invention solves. The invention needs to be as natural and safe as possible.

Third, even if the intense sweeteners could be baked, the aftertaste in the food product is not desirable. One complaint heard very often was that the intense sweeteners have a definite unpleasant aftertaste when used in food compositions. The need for a synergist

sweetener that has a real sugar taste is apparent. The public conception of intense sweeteners is clouded with their past experiences of intense sweeteners having a strong aftertaste with such limited applications.

Fourth, the need for a low calorie sugar is well known. See Table 1 for a comparison between intense sweeteners, bulk sweeteners, sweeteners.

TABLE 1

SWEETENERS (SUGARS), INTENSE SWEETENERS, AND BULK SWEETENERS CHART

Type of Sweeteners	Name	Sweetness Intensity	Suitable for Diabetics	Natural	Calorific Value (kcal/g)	Water Solubility at room temp. (%)	Cooling effect	ADI (Accepted Daily Intake)	Caris Producing
Sugars	sucrose	1	no	yes	4	65			yes
	fructose	1.5	yes	yes	4	79			yes
Sugar alcohols	lactitol	0.4	yes	yes	2	60	slight	20 grams	no
	maltitol	0.8-0.9	yes	yes	3	60-90	slight	100 grams	no
Randomly polymerized dextrose	polydextrose	0	yes	yes	1	70	slight	100 grams	no
Fructooligo-saccharides	inulin	less than 10	yes	yes	1	60-90	none	0	slight*
Intense Sweeteners	acesulfame-K	about 200	yes	no	0	20	none	15mg/kg body weight	no
	aspartame	about 200	yes	no	4	N/A	none	2.4 grams	no
	talin or thaumatin	about 3000	yes	yes	4	N/A	none		no
	licorice extract	40	yes	yes	N/A	N/A	none	0	no

*This bulk sweetener is tooth friendly. Any breakdown by bacteria in the mouth is so slow that there is no resultant tooth decay.

The present invention is "low calorie" which means to have ½ the calories or less of sucrose. To make the present invention low or reduced calorie, bulk sweeteners have to have

less than the four calories per gram found in regular carbohydrates. The bulk sweeteners must be diabetic safe by not significantly raising the glucose and insulin levels in the blood. The search for bulk sweeteners falling within this category is very limited. Intense sweeteners are substances which are usually at least 40-3000 times as sweet as sucrose. The quantities of the intense sweeteners used are in such small quantities even if they did contain four calories per gram, the overall effect is minimal in calorie contribution and thus diabetic safe. Bulk sweeteners usually are less sweet than sucrose giving some added sweetness, bulk and texture to ingestible foods. The groups of bulk sweeteners available with fewer calories and diabetic safe usually fall into the category of polysaccharides. This group of bulk sweeteners is neither hydrolyzed nor absorbed in the small intestine. Thus, they reach almost unchanged into the lower bowel area. In the large intestine, the polysaccharides are fermented by the intestinal micro flora. They are metabolized into volatile fatty acids, CO2, and H2. Together with the increase in biomass this requires 50% or more of the available energy. The fatty acids are absorbed and metabolized further in the body resulting in an energy value of less than four calories per gram, usually falling within two calories per gram or less. This type of metabolism is in many ways similar to that of dietary fiber. These oligosaccharides and polysaccharides are metabolized independently of insulin and only contributes less than the calories of normal carbohydrates. In fact this makes them ideal for the diabetic person, who must not only watch the consumption of sugar but also the consumption the number of starches and sugars (carbohydrates) in their diet. Because of the way these carbohydrates are fermented, the diabetic individual does not have to count them as normal carbohydrates.

These bulk sweeteners are also known to be tooth friendly. "Tooth friendly" means that the oral bacteria cannot convert the polysaccharides into sugar and thus keep the pH in the

mouth from falling below 5.7 as does sucrose. These polysaccharides are poorly utilized by streptococcus mutans, an organism found in the human mouth which form's plaque and acids. One key to the streptococcus mutans failure to work is associated with a higher pH level that is in the human mouth during the time of eating these polysaccharides. Sugars normally lower the pH level while being metabolized in the human mouth thus providing the ideal pH setting to allow the streptococcus mutans to work in the best environment leading to caries. The prior art uses these polysacchrides as a bulking agent used in situations of reduced sweetening and reduced fat applications as partial replacements, especially in the art of creating low calorie, sugar free gums.

One of the major problems associated with the use of polysaccharides in a complete sugar substitute is the need to keep the levels or percentages by weight low in the synergistic sweetening composition if they have a lower acceptable daily intake (ADI). The major effects of increased levels of polysaccharides are softer stool, diarrhea and flatulence. Some polysaccharides acceptable for use in this type of application frequently have an ADI. Both the Joint Expert Committee for Foods (EEC, 1984) have evaluated and set the (ADI) 'not specified'. This ADI is set up as a guide to tell us how much can be eaten daily without causing the laxative effects except in sensitive individuals. As a result these polysaccharides have to be monitored to make sure that they are not eaten in large quantities especially in one sitting.

The bulk sweeteners or at least a portion of them must have similar physical properties of sugar. The bulk sweeteners including polysaccharides and oligosaccharides come in either crystalline, powdered or granulated forms. The present invention can use these bulk sweeteners in the powdered form, in the crystalline form, in the granulated form or mixtures

thereof. The other requirements are that they are soluble in water, heat stable, able to withstand changes in pH, have no aftertaste and hopefully have the same viscosity of that of sugar solutions. The boiling point and freezing point depression of these bulk sweeteners need to be the same or very similar to sucrose. The water activity of some bulk sweeteners influence product microbial stability and freshness; thus it is wise to pick one with similar molecular weight as close to sucrose. Picking the bulk ingredients that were natural and at least one of them to actually contribute soluble dietary fiber (so lacking in Western diets) was also important in the final criteria. In the prior art of the other patents using polysaccharides and oligosaccharides as bulk sweetener or bulking agents, no disclosures were made using all the criteria for choosing the correct bulking sweeteners. There have been no patents identified that included the need to monitor the bulking ingredients for ADI, the need to include bulk sweeteners with sucrose physical characteristics to achieve success in the problem area of baking and cooking, the need to invent a sugar replacement for brown sugar, and no mention of simple sugars to help the browning effect of baked products.

The bulk sweeteners used most often in the present invention are listed with references to prior art. Maltitol is a polyol alcohol with many characteristics of sugar (sucrose). It is derived from maltose. It has an ADI of 100 grams per day which is a very high ADI for a polyol alcohol. Maltitol also comes in a crystalline form which is .90 times as sweet as sucrose and makes it an ideal for use as a sugar substitute. It has three kcal/gram which is slightly higher in calories than some of the other sugar alcohols but when used together with the lower calorie bulk sweeteners it still helps reduce the overall kcal/g in the present invention. It is diabetic safe and tooth friendly. The calories are slightly higher than that of lactitol, but the ADI is five times higher making it better when you look at the laxative and flatulent side

effects. Lactitol was discovered in 1920 and has been available commercially since the early 1980's. It is a disaccharide sugar alcohol produced commercially by the catalytic hydrogenation of lactose. Further purification by crystallization (monohydrate) and further processing ensures very high purity and flowability. It is 0.3 to 0.4 times as sweet as sucrose and has a caloric value of only two kcals per gram. Its ADI has been assigned at 20 grams per day, thus limiting the amount of lactitol that can be added in a sugar substitute.

The prior art listing lactitol and maltitiol as a bulk sweetener in different applications is well known. Lactitol in the past has been used mainly in chewing gum applications because of the small amount needed. In the sugarless or low calorie gum patents listed above, they list polyol alcohol as a form of a bulk sweetener that can be used, and sometimes they are listed by name. U.S. Patent No. 5,043,169 discloses a stabilized dipeptide sweetening composition useful in chewing gum applications. This composition includes an encapsulated intense dipeptide sweetener wherein said inert material is selected from the group consisting of polyols, calcium phosphates, carbohydrates and mixtures thereof and wherein said polyol is selected from the group consisting of mannitol, xylitol, erythritol, sorbitol and mixtures thereof. U.S. Patent No. 5,098,730 by Tammy Pepper uses xylitol and a reduced calorie bulking agent in a reduced calorie, non-carcinogenic sweetener. Xylitol is a polyol alcohol but has a strong burning aftertaste especially used in larger quantities and it also is not a reduced calorie sweetener. It has the four kcal/ gram as does sucrose. Again U.S. Patent No. 5,106,632 ENHANCED SWEETNESS OF ACESULFAME-K IN EDIBLE COMPOSITIONS discloses that the composition of the invention can be used in certain foods including a baked product such as a cake or cookie. The preferred products that employ the invention compositions are chewing gum and confectionery products. It also says that the composition

of the invention can be in association with suitable non-toxic carriers. These carriers can include lactitol, polysaccharides such as polydextrose, and others. It tries to include every and any combination, yet does not tell how to do this, and thus every type of food, recipe or possible use would have to be formulated separately to match the food use.

U.S. Patent No. 5,342,631 discloses the petroleum wax-free chewing gum containing special non-cariogenic oligosaccharides, sweeteners, and flavors. These non-cariogenic oligosaccharides are preferably low calorie and act as binders when formulated in the wax-free gums.

Claim 42 states:

> The petroleum wax-free chewing gum of claim 22 wherein: a) the sweetener comprises a mixture of a high intensity sweetener at least 20 times sweeter than sucrose and at least one sugar alcohol selected from the group consisting of sorbitol, mannitol, xylitol, maltitol, lactitol, hydrogenated isomaltulose and hydrogenated starch hydrolysate: b) the binder system comprises at least one non-cariogenic oligosaccharide selected from the group consisting of indigestible dextrins, polydextroses, oligofructoses, isomalturlose oligosaccharides, and fructoligosaccharides, said oligosaccharides or their blends, being present in the binder system at between about 40 weight percent to about 90 percent of the total binder system.

But again it is in a chewing gum in very small amounts, not in a sugar used to replace sugar in a one-to-one substitution in all types of ingestible foods.

The bulk sweetener polydextrose is well known in the art of replacement partially for sugar or fat in food products. It is a water soluble, low calorie, non-cariogenic bulk sweetener. Polydextrose can be bought in several forms that all contain quantities of unreacted monomers, such as glucose, sorbitol, as well as citric acid. Improved polydextrose is a randomly bonded condensation polymer of D-glucose with some bound sorbitol and citric acid. It is substantially free of certain low molecular weight organic acids (pH 3-4). Removal of these low molecular

weight organic acids has helped to eliminate the bad taste that has been known to be associated with polydextroses. Many patents issued have centered on the basis of masking the off taste so associated with polydextrose. It is found in a granulated powder that has an odorless, bland taste and a one kcal/gram low caloric value. The bland taste of improved polydextrose makes it necessary to use intense sweeteners, and the common art of using it with other bulk sweeteners in the area of sweeteners is well known. In the area of fat replacements it also needs flavorings, additional fat, and other bulk sweeteners conductive to fat replacing. It has an ADI of 90 grams per day which makes it more acceptable as a bulk sweetener to help lower the side effects of the lower amounts used of the lower ADI ingredients. The other benefit is that it is lower in cost than the inulin, lactitol or maltitol which is the reason for its inclusion as a portion of the total bulk of the present invention. The overall cost of this synergistic sugar replacement is important in the view of marketing it and the fact that customers need to be able to afford to use it. It has been recommended by a large manufacturer of improved polydextrose to not replace more than 40% of the sugar in a baked recipe (such as cookies, cakes, pastries, etc.) using this bulk sweetener. Some of the previously listed U.S. patents using polydextrose as a possible bulk sweetener are: U.S. Patent No. 5,342,631 used in chewing gum, U.S. Patent No. 5,106,632 in chewing gum, U.S. Patent No. 5,098,730 in a dietetic sweetening composition, U.S. Patent No. 5,043,169 in a stabilized sweetener composition useful in chewing gum applications, U.S. Patent No. 4,983,405 possibly can use it in a sugar-free, low calorie chewing gum, and U.S. Patent No. 5,059,428 uses this synergistic sweetening composition in chewing gum, some confectionery compositions, beverages, and the like. It does not work in all types of food applications as a complete sugar substitute. U.S. Patent No. 5,082,671 discloses using polydextrose as the sole

soluble bulking agent in a gum base. U.S. Patent No. 5,098,730 discloses using polydextrose as a preferred polymer type of bulking agent in sugar free boiled hard candies preferably with intense sweeteners added before or after the cooking of the candy. Again this is not a one-to-one sugar substitution in all ingestible foods. This patent uses it in one type of food, boiled hard candies. U.S. Patent No. 5,236,720 discloses a sugar-free, low calorie chewing gum utilizing polydextrose as the sole bulking agent. It also lists using a minor amount of one bulk sweetener selected from the group consisting of polydextrose, sugar, sugar alcohols and mixtures thereof. Again this is not a one-to-one sugar substitution in all ingestible foods. This patent uses it in one type of food, boiled hard candies.

Oligosaccharides are bulk sweetener which includes inulin derived by means of hot water extraction of chicory root a natural fructooligosaccharide (a 100% vegetable product). Inulin provides a synergist sweetening composition that is low calorie content with high dietary fiber using ingredients of natural origin and composition. Inulin has several bulk sweetening properties of sugar including excellent taste and synergistic properties. Inulin contributes several physiological properties and provides many surprising and unique beneficial health effects. These health benefits which are published by Imperial - Suiker Unie include: 1) reduced fecal pH; 2) modification of fecal micro flora (bifidogenic effect); 3) altered metabolism of bile acid; 4) reduction in toxic metabolites; 5) enhanced stool bulk and weight; 6) accelerated stool transit; 7) reduction in constipation; 8) increased colon mucosal weight; 9) reduced serum cholesterol and triglycerides; 10) reduced hepatic cholesterol and triglycerides; 11) reduced low density lipoprotein (LDL), increase in HDL/LDL ratio; 12) reduced blood pressure of elderly hyperlipemic people; 13) normalized blood glucose and serum lipids; 14) improves derangement of carbohydrate and lipid metabolism in diabetics; 15)

improved mineral absorption (Ca + 2, Mg+2, Fe+2, PO4-3); and 16) a potential source of energy in patients exhibiting malabsorption disorders. On the way to the digestive tract there is no breakdown of inulin by endogenous enzymes. This qualifies inulin as a solitary dietary fiber which possesses highly distinguishing properties such as an extremely low energy value. One kcal/gram of inulin has no ADI limits as do the other bulk sweeteners. Prior art using fructooligosaccharides are very limited and most of them use fructoligosaccharides in low fat applications. Inlin has a great tendency to absorb up to 1.5 times its weight. This can cause a negative effect if used as the only bulk sweetener in a 100% sugar replacement.

The U.S. Patent No. 5,342,631 lists a binder system possibly containing fructoligosaccharides in gum. U.S. Patent No. 5,169,671, FOOD CONTAINING FRUCTOSE POLYMER discloses using polyfructan, as a replacement in part or the whole for gelation materials, low calorie sugars and /or oils and fats. The patent uses the polyfructan as the necessary mass and volume bulking agent and also states that the food incorporating polyfructan may also contain a sweetener having a high degree of sweetness, i.e., aspartame. Low calorie baked products are named as a food that can be used. The patent doesn't state whether it is the fat replacement used in these foods or the sugar replacement. It is well known that aspartame does not bake well, nor does it do well under heat, ph., and moisture plus other facts listed above in the intense sweetener section. In the examples 10-17 given in the body of this patent, the baked food items used this invention to replace the shortening. Examples 24 & 25 used less sugar but the invention did not replace 100% of the sugar. Using only aspartame and a polyfructan, the sweetness would not be sufficient due to the loss of sweetness after baking to replace the sugar 100%.

Also each food had to be adjusted on a recipe basis as required when using the other compositions listed under the prior art above.

International Patent Publication # WO 93/02566, REDUCED CALORIE CHOCOLATE CONFECTIONERY COMPOSITIONS, by De Soete, J. discloses an invention of a reduced calorie chocolate confectionery composition which possibly may also have a reduced digestible fat content. The sugar is wholly and partially replaced by a product selected from the group consisting of inulin, branched inulin, linear fructoligosaccharides, branched fructoligosaccharides or a mixture thereof, with possibly a high intensity sweetener. It does list several bulking sweeteners that could possibly be added. This patent limits itself to chocolate confectionery compositions and not a sugar replacement for other foods.

The simple sugars found in inulin include naturally occurring mono and di-saccharide including fructose, sucrose and glucose. Inulin can be produced without the simple sugar fraction. This inulin has been shown to cause less flatulent gas that the inulin with the sugar fraction. Additional fructose can be added to help with the browning of baked ingestible foods. Fructose is a mono-saccharide that is 1 ½ times sweeter than sugar. It is commonly known as the sugar found in fruit. It is a carbohydrate that has four kcal/gram and is typically formulated in diabetic foods because it is absorbed only very slowly by passive transport or facilitated diffusion in the intestinal lumen, thus not contributing significantly to a blood sugar effect. These simple sugar components of the present invention are at concentrations that are relatively small as compared to the weight percentages of the inulin and the weight percentages of the bulk sweeteners in the present invention. The compositions simple sugar effects of the blood sugar are very minor, if not

negligible. In addition to their relatively small concentration, studies have shown through mediation effects of short chain fatty acids (SCFA's), produced from inulin fermentation in the stomach, inulin also reduces blood sugar effects of digestible carbohydrates, like sucrose and glucose, thus improving glucose tolerance. The amount of simple sugars is intentionally kept low. It is so low in fact that when the present invention is added to yeast dough, there is not enough sugar to feed the yeast for proper raising of the dough. In the case of yeast doughs, it is necessary to use some additional sugar to feed the yeast. Breads and rolls have been typically low in sugar anyway and have not been a problem for diabetics to eat in controlled portions. The prior art using fructose as a sweetener is well documented, but the only use of fructose in our invention is browning purposes of baked food products. U.S. Patents using simple sugars in this browning manner have not been located.

SUMMARY OF THE INVENTION

This invention pertains to a substitute for granulated sugars, brown sugars, and powdered sugars achieved by combining one or more intense sweeteners; two or more bulk sweeteners that include at least one oligosaccharide high in dietary fiber and bifidobacteria promoting; a small amounts of simple sugar sweeteners to help with the browning of the baked food products; anti-flatulent agents used to help to break up the gas created as the polysaccharides are metabolized by the intestinal micro flora; and flavoring agents. The sugar substitute is very stable under processing conditions including heat, pH, moisture, (including aldehydes), and ketones of cinnamon flavor and is a one-to-one substitution for granulated sugars, brown sugars, and powdered sugars.

The preparation and processing of this composition are very stable and not limited to heat, varying degrees of pH and moisture conditions. The composition will not significantly increase the glucose and insulin levels in the blood and is called "diabetic safe." This composition is formed whereby stable ingestible food is made having reduced calories, being diabetic safe, and having other health promoting benefits including the addition of soluble dietary fiber. These ingestible food products can include beverages, confectioneries including chocolates and candies, bakery items, main dishes, pharmaceutical products, salad dressings, frozen confectionery products, dairy products, oral hygiene products and jams and jellies. The food preparations are comparable in taste, appearance, texture and to real sugar food products.

The present invention is a non-toxic, low calorie, diabetic safe, tooth friendly synergistic sweetening composition that can be used to substitute the whole of the granulated, brown sugar and powdered sugar in ingestible food products. The very stable synergistic sweetening compound also can be used in many types of preparations and processing techniques. The one-to-one substituting of sugar makes it easy for all types of cooks to substitute the whole of the sugar in recipes and applications without tedious recipe adjustments. Prior art shows that each type of food and food composition had to be adjusted individually to replace at least part or the whole amount of the sugars with at least one intense sweetener and possibly adding bulk sweeteners.

The present invention is a timely answer to diabetics, obese individuals or individuals who are sugar intolerant and suffering from other major life threatening diseases. The present invention met several criteria important to solving many of the

problems associated with the use of intense sweetener and bulking sweeteners. The synergistic sweetening composition has the following properties:

1) retains its sweetness under heat, varying degrees of pH, and moisture;

2) synergizes with the available intense sweeteners and bulking sweeteners to release a pleasant, well rounded, natural sugar taste;

3) solves the bulk problem well known in the art of baking and cooking;

4) is diabetic safe;

5) is tooth friendly;

6) has lower calories than sucrose by at least 50%;

7) is high in soluble dietary fiber;

8) selects ingredients that have health benefits, such as the benefits attributed to inulin; and

9) picks as many all natural ingredients as possible that work together;

One-to-one replacement means duplicating the weight, volume measurements and characteristics of real sugar as close as possible. This makes the measuring and use of the present invention as easy as it is using and measuring real sugar. To make the measurement system work, bulk ingredients need to be used with as close as possible granular, crystalline, or powdered sugar to the match size of sucrose that you are trying to replace. An example of this is that you pick the lactitol and maltitol the same crystalline size as granulated sucrose when making formula 1 and 1A, or slightly larger so that it will make up for the inulin which does not come in aform that is crystalline or is as heavy per granular as sugar. This way the preferred invention formula will weigh as much as sugar cup for cup. It is important to take all this into consideration when engineering the formula

to measure one for one for granulated sugar, brown sugar and powdered sugar. See Table 2 - Volume and Weight Measurement Comparisons.

TABLE 2
VOLUME AND WEIGHT MEASUREMENT COMPARISONS

WEIGHT	200g	200g	120g	120g	200g
SUGAR OR SUGAR/SUB.	GRANULATED SUGAR	FORMULA 1/1A GRANULATED	POWDERED SUGAR	FORMULA 2/2A POWDERED	BROWN SUGAR
VOLUME-MEASUREMENT	1 CUP	1 CUP	1 CUP	1 CUP	1 CUP

Polysaccharides release gas when fermented in the colon. The bulk sweeteners had to be added to the present invention with ADI and possible side effects in mind. The goal was to reduce the unpleasant side effects of flatulent gas as much as possible by the percentages by weight of these ingredients as the synergistic sweetening composition was formulated. Research into relief of the flatulent gas was paramount in including an anti-flatulent agent that could work after undergoing various preparation and processing techniques. Research into how the human body handles fibers and polysaccharides is very similar. When fiber is ingested in a large amount for the first time, the side effects are similar to eating polysaccharides for the first time. As we introduce both the fiber and polysaccharides into our diet, slowly our bodies build up a tolerance to the side effects. More and more of the fiber, polysaccharides, or both can be ingested. Increase in water consumption can also help with the amount of flatulent gas formed. A small amount of a mono or di-saccharide can be added to help the browning of the baked food product. Sugars can cause the desired browning in an ingestible food by the method of caramelization. Caramelization occurs when sugars are heated to such intense temperatures

that they melt and a series of chemical reactions begin to take place, which ultimately can lead to a charred or burned product if not careful. Some caramelization is desired. The Maillard Reaction is another way ingestible foods brown is described as non-enzymatic browning. It to is a series of reactions involving the condensation of a sugar and an amine. During the course of this series, the product is transformed from an essentially colorless substance to a golden color and darker if not watched. Natural fructose is the preferred embodiment because it is easily tolerated by diabetics. Inulin can contain up to 8% of free mono-and di-saccharide.

The study of Table 3 shows the blood glucose levels in the blood after a four hour fast. The person tested was then given 12.5 grams (1 tablespoon) of glucose in water and their blood glucose levels were tested every 15 minutes up to an hour. Again the same persons blood glucose levels were tested after 4 hours of fasting and then ingesting 12.5 grams (1 tablespoon) of Formula 1 of the present invention in water. The testing continued every 15 minutes for 1 hour. The study shows how the body can handle the present invention without significant increases in the blood glucose and insulin levels.

TABLE 3

BLOOD GLUCOSE COMPARISON TEST RESULT

Person Tested	#1	#2	#3	#4	#5	#6
Fasting Blood Sugar mg/dl	82	83	87	80	77	89
Blood Sugar after eating 12.5 grams of glucose mg/dl						
15 min.	90	93	97	86	88	102
30 min.	121	125	130	119	135	125
45 min.	113	110	116	118	121	118
1 hour	110	108	112	111	115	99
Fasting Blood Sugar mg/dl	77	80	82	83	79	85
Blood Sugar after eating 12.5 grams of Formula #1 mg/dl						
15 min.	78	81	84	83	78	86
30 min.	78	82	85	82	77	84
45 min.	76	79	81	80	77	83
60 min.	74	78	79	79	75	82

The argument can be made that when using the present invention as a one-to-one substitution for the whole of the sugar in ingestible foods that you replace it with a composition that has a small amount of simple sugars in it. This is true, but the goal of using this invention as a one-to-one substitution is to make it easy to substitute the total amount of sugar called for with the same amount of the present invention. The simple sugars have been added only as a browning agent to help the overall performance of the present invention in the area of baking. The present invention does work in all types of

applications without the small amount of simple sugars. The sugars can be optionally added to help with the browning effect. Great care has gone into making this synergistic sweetening composition an overall sugar substitution for all types of applications while at the same time keeping the present invention diabetic safe.

Other objects, advantages, and capabilities of the present invention will become more apparent as the description proceeds.

The method for manufacturing asynergistic sweetening composition comprises:

(a) preparing a diluted mixture of intense sweeteners and water at a correct strength needed for the composition;

(b) spraying the diluted mixture over bulk sweeteners;

(c) drying the above mixture;

(d) mixing the bulk sweeteners and intense sweeteners in adrum mixer for about 20 minutes until completely dispersed;

(e) adding the intense sweeteners, the flavor enhancer and the anti-flatulent agent to the bulk sweeteners and intense sweeteners and mixing until completely dispersed;

(f) pouring the finished mixture into air tight packaging and sealing.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention, it has been found that the synergistic properties of the intense sweeteners and bulk sweeteners have increased dramatically the overall effect in foods. Synergy is the level of perceived sweetness that becomes the greater than the sum of the parts. It increases the pleasant sugar taste in all types of

ingestible foods. The sweetness in this invention is retained under processing conditions including, but not limited to the pH, moisture, and heat. This makes it ideal for processed ingestible foods that undergo high intense heat. The only exception known is that there is not enough mono or di-saccharide in the invention to feed the yeast necessary to raise yeast doughs. The synergistic effect makes it possible to use less of each of the intense sweeteners (up to almost 50% less) of two intense sweeteners combined compared to 100% of the original intense sweetener's sweetness level. This lowers the cost of the amount of intense sweeteners used but also increases the synergy of the bulk sweeteners. The synergy effect is also found to be flavor-enhancing characteristics that have been demonstrated by masking many "aggressive" flavors such as cinnamon, peppermint, ginger, coffee, etc. The addition of a natural flavor enhancer, ethyl maltol also clarifies the cotton candy flavor used in table top testing.

The present invention solves the bulk problem so necessary when replacing all the sugar in a baked food product. In the past, taking two cups of sugar out of a cake recipe and replacing it with asmall amount of intense sweetener or even apartial bulking agent caused the texture, appearance, and taste to be lacking. Baking and cooking recipes contain many ingestible food products that simply do not turn out the same if the bulk is not replaced. The bulk sweeteners should have many of sucrose's physical characteristics including and not limited to solubility, sweetness, viscosity, and tolerance to heat.

The present invention can be used in a one-to-one substitution of granulated sugar and with the simple addition of a brown sugar or molasses flavoring at the time of mixing, it can replace brown sugar in all ingestible foods. Many recipes call for brown sugar and would be very limiting if you used the present invention to substitute the granulated sugar

and still left in the brown sugar. The synergistic sweetening composition is prepared with the addition of brown sugar flavoring, molasses flavoring, or mixtures thereof in ingestible foods. See Table 4 - Brown Sugar Substitution Chart.

TABLE 4

BROWN SUGAR SUBSTITUTION CHART

Brown Sugar	=	Brown Sugar Flavoring &	Invention
1/2 cup		1/2 tsp	1/2 cup
1 cup		1 cup	1 cup
1 pound		2 tsp	1 pound

The present invention can also be used in a one-to-one substitution of powdered sugar. The bulk sweeteners must be in powdered form to add a pleasant mouth feel. The invention used in a one-to-one substitution of the whole powdered sugar in ingestible food includes but is not limited to icings, frostings, sprinkled on food, candy, and marshmallows.

The significant aspect of the one-to-one substitution is the ease in substituting all the sugar in ingestible foods without complicated experimentation on each food product The consumer, whether a home cook, chef, a restaurant cook, manufacturer of large volumes of ingestible products, or anyone else that will use this invention will not have to adjust the sugar substitution amounts for each recipe because that time consuming detail has been eliminated. The mixing and addition of this invention to ingestible food are exactly like adding sucrose or other sugars into the same foods with no special instructions.

The present invention is diabetic safe. That means that the carbohydrates (excluding the simple sugars) do not have to be counted by a diabetic person, whereas in sugar and starch

carbohydrates this is not the case. The bulking ingredients used in the present invention are labeled nutritionally under "other" carbohydrates except for the small amount of the simple sugars. The diabetic individual does not have to count these as carbohydrates that can significantly raise or lower the glucose of insulin in their blood. The labeling of foods made with the invention can be labeled "reduced or low calorie" depending on the finished ingestible food's final nutritional information, "diabetic safe" or "tooth friendly". The finished ingestible food product can even be more reduced calorie or low calorie when used in conjunction with a fat substitute. This is so important to the individual who is obese or diabetic.

If the present invention uses the pearl aspartame as one of the intense sweeteners, it has been reported by Holland Sweetener Company that this particular type of aspartame bakes better if used in a low fat mixture. Such an example of this is using it in conjunction with the one-to-one low fat substitute disclosed in patent application no. 08/516,868 filed on 08/81/95 by the same inventor. In using the pearl aspartame as part of the invention with the one-to-one fat substitution no undesirable effects are observed. If the food mixture is high in fat, sometimes the pearl form of aspartame leaves behind small hard balls of undissolved aspartame especially in foods such as cookies that are cooked a shorter period of time. Still, the pearl form of aspartame is preferred over the encapsulated form of aspartame as previously described. It bakes and retains its sweetness better in baking and cooking application than the encapsulated form.

The method to produce the synergistic sweetening composition includes the following steps. First, if using an intense sweetener such as talin or any sweetener that is at least 2000 times sweeter than sucrose, it has to be diluted to the strength needed in the embodiment. Talin is 3000 times sweeter than sucrose and over $12,000.00 dollars a kilogram. With the

synergistic effect of using it with a combination of other intense and bulk sweeteners the talin sweetness can increase up to 40,000 times sweeter than sucrose. Using such small amounts of talin require that the talin be diluted in a water to the strength needed in this present invention and then sprayed evenly over one of the bulk sweeteners or sweeteners, such as the fructose. That way the talin would be evenly dispersed throughout the embodiment and not be lost by using minuscule amounts.

Second, the rest of the bulk sweeteners and sweetener (fructose) that include the talin are mixed in a rotating drum mixer until completely dispersed. The acesulfame-K, or other intense sweeteners, that are around 300 times sweeter or less can be added with the anti-flatulent agents, Yucca schidigera extract or other anti-flatulent agents, to natural flavor enhancer ethyl maltol. They need to be added toward the end of the process and mixed until evenly dispersed. The humidity the day of the mixing should be low to prevent caking and ingredients sticking together. Lastly, the composition is poured and sealed into air tight packaging and stored in a cool dry place.

The method of processing reduced calorie and diabetic safe ingestible products using the present invention includes normal preparation methods, i.e. baking, cooking, mixing of uncooked mixtures, table top use, and manufacturer's processing techniques, etc., as described later in Examples 1-12 - Ingestible Foods-Sugar and Fat Comparisons.

The present invention contains one or more intense sweeteners that can be derived from the following groups of tooth friendly, natural and synthetically made intense sweeteners.

The groups consisting of dipeptides such as aspartame includes both the encapsulated and pearl forms, acesulfame-K and its salts, thaumatin or talin with or without Arabic gum, saccharin and its salts, cyclamate and its salts, chlorodeoxysugar derivatives such as sucralose,

alitame, xylitol, stevioside, glycyrrhizin, dihydrochalcones, monellin, chlorodeoxygalactosucrose derivatives, the icorice extract, or mixtures thereof. Each of these intense sweeteners has adistinct sweetening intensity compared to sucrose.

These intense sweetening agents of the present invention can be used in many physical forms well known to the art. These physical forms can include spray dried, powdered, beaded, pearl, encapsulated forms, liquid form in use in liquid sweeteners and mixtures thereof.

The present embodiments further comprise the use of one or more bulk sweeteners or agents that can be derived from the following groups of natural and synthetically made non-cariogenic bulk sweeteners. These bulk ingredients fall into the category of diabetic safe and tooth friendly. They need to have less calories per gram than 4 k/cal per gram found in carbohydrates from sugars and starches. The first group consists of polyol alcohols that include lactitol, maltitol, mannitol, sorbitol, erythritol, galactitol, isomaltulose, polyglucose, polymaltose, carboxymethylcellulose, carboxyethylcellulose, arabinogalactan, microcrystalline cellulose, polydextrose and improved polydextrose, palatinit, indigestible dextrins, or mixtures thereof.

The present embodiments further comprise the use of one or more oligosaccharides from the second group consisting of inulin, branched inulin, linear fructo-oligosaccharides formed from hydrolysis of inulin, branched fructo-oligosaccharides formed from fructosyl transferase reaction on sucrose, or mixtures thereof. The inulin can be derived from chicory extract or from over 35,000 other plants containing inulin. The fructooligosaccharides are obtained from processes used on saccharose, fructose, fructans, levans, from their products of hydrolysis, or from the plants with fructans.

The synergistic sweetening composition is comprised of one or more mono or di-saccharides to be added or occur naturally in the oligosaccharide. The addition of this group is to help in the browning of the finished baked product only. These sweeteners are considered simple sugars and have four kcal. per gram. They are listed under carbohydrate - sugar on a nutritional label. The small amount of the simple sugars is important so that it will not significantly raise the glucose and insulin levels of the blood when used in the present invention in ingestible foods. The group consists of fructose, glucose, sucrose, or other simple sugars, or mixtures thereof.

The synergistic sweetening composition contains one or more anti-flatulence agents which include lactobacillus acidophilus cultures, yucca schidigera extract, or simethicone, to help with the discomfort of the gas produced in the large intestine or colon caused by the fermentation of the polysaccharides by the micro flora. This addition of these agents does not affect in any way how the present invention sweetens or works as a sugar replacement. The research on anti-flatulence ingredients that can withstand high temperatures of processing after being added to the present invention is not known. In fact the whole area of anti-flatulent agents that work in the large intestine or colon after the ingestion of ingestible foods is very limited. There is quite a bit of research on simethicone as an anti-flatulent which is believed to work as an anti-foaming drug which helps to break up the gas bubbles in the colon. It is used in many over-the-counter drugs for indigestion, diarrhea, flatulence, heartburn, etc. To work in the present invention, it can be encapsulated with various coatings to work more effectively after the baking, cooking or processing in high temperatures. Lactobacillus acidophilus culture has many of the same characteristic benefits of the inulin as far as the bifidogenic effects in the colon are concerned. It also has been known to help with flatulent gas. The

drawback of using this as an ingredient in the present invention is that the bacteria and enzymes in this culture are not heat resistant and are killed off when heated in ingestible food products that require baking and cooking especially with longer cooking times. Still some small helpful effects are left from the products left after the metabolism of the other components of the culture by the lactobacillus bacteria. The actual by-product that accomplishes this effect is unknown at this time. Yucca schidigera extract is known as a natural anti-foaming agent and is not a drug. It has never been used before as an anti-flatulent agent. The research on the testing of yucca schidigera as an anti-flatulent agent is non-existing. It seems to work in the same way as simethicone does as an anti-foaming agent in the large colon to help break up the large gas bubbles. In some forms it can have a very strong taste and can be encapsulated to mask the strong flavor when incorporated into the present invention.

The present invention composition looks like a white, dry, slightly powdered and crystalline composition. It has a sweet cotton candy flavor when tasted by itself. The invention is water soluble and the flavor becomes more sugar-like when it is mixed into liquid used in food processing. The solubility of the invention increases as the temperature rises and it thus increases in sweetness. See Table 1- Sweeteners (Sugars), Intense Sweeteners, and Bulk Sweeteners Chart. It is readily soluble in water and can rapidly dissolve and be easily mixed into foods and beverages without new mixing instructions. The sweetness of the composition is usually very rapidly perceived providing an "impact" sweetness and the synergistic effects of the ingredients gives it a well-rounded profile. The present invention is very stable if stored air tight and in a cool, dry place. Some of the ingredients have a tendency to be hygroscopic and can absorb water from the humidity in the air if not covered well. It is

still stable when exposed to high temperatures for a limited time period which can occur under unfavorable storage conditions.

The form of the present invention can be put into bulk packaging for consumers or commercial use, measured packets, tablet form, dissolved in a liquid for a tabletop sweetener if so desired or in the case of a liquid sweetener used in certain food production or other types of uses. Liquid glucose and fructose syrups are examples of a liquid sweetener used in many special applications.

The present invention consists of one or more natural or artificial intense sweeteners. One goal is to achieve an all natural synergistic sweetening composition, but taste overrules the natural sweetener requirement. The intense sweeteners are at a level of from about 0.001 to 8 weight percent. Two intense sweeteners are used in the preferred embodiment. The present invention consists of two or more natural or artificial bulk sweeteners at a level of from about 0.5 to 99 weight percent. The preferred embodiment includes two natural bulk sweeteners. The present invention consists of one or more of the bulk sweeteners to include a natural or artificial oligosaccharides. The oligosaccharide in the preferred invention is natural inulin from chicory root. The present invention consists of one or more natural or artificial sweeteners which include mono or di-saccharide to help with browning at a level of from about 1 to 15 weight percent. The preferred embodiment can include naturally occurring fructose, glucose, and sucrose in inulin and additional fructose. The synergistic sweetening composition consists of one or more, natural or artificial anti-flatulent agents at a level of from about .001 to 5 weight percent. The present invention consists of one or more flavoring agents at a level of from about .0001 to 5 weight percent. The preferred embodiment includes a

natural flavor enhancer, ethyl maltol and a natural brown sugar flavoring to use in brown sugar replacement.

FORMULAS

The present invention embodiment has two preferred formulas for granulated or brown sugar listed as Formula 1 and Formula 1A. And two preferred formulas for powdered sugar Formula 2 and Formula 2A. Note that the mixing instructions have been described previously.

FORMULA 1 Granulated or Brown* Sugar

TYPE	INGREDIENT	WEIGHT PERCENT
Intense	Acesulfame-K Talin	.0015% .0001%
Bulk	Inulin from chicory extract Maltitol Lactitol	 50% 33.98% 12%
Sweetener	Fructose	4%
Anti-Flatulent Agent	Yucca schidigera extract	.0084%
Flavoring Agents	Ethyl maltol	.01% 100%

* Add brown sugar or molasses flavoring according to Table 4 when substituting for brown sugar.

NUTRITIONAL INFORMATION FOR FORMULA 1

	FORMULA 1	GRANULATED SUCROSE	LESS CALORIES
WEIGHT	100g.	100g.	
VOLUME-MEASURE	½ cup	½ cup	
CALORIES			
TOTAL	189k cal	400k cal	52.7% less
CARBOHYDRATES			
SUGARS	97g.	100g.	
STARCHES	8.3g.*	100g.	
	0	0	
OTHER**			
DIETARY	45.5g	0	
FIBER	43.2g.***	0	
% OF CALORIES			
FROM	17.5%	100%	
CARBOHYDRATES-			
SUGAR			

* Some samples of insulin contain less than 8.6% simple sugars.

** "Other" carbohydrates are not counted as carbohydrates to the diabetic. These 'other' carbohydrates do not significantly raise the glucose or insulin levels of the blood and they have less than 4 k cals per gram found in sugars and starches.

***Solitary Dietary Fiber from inulin.

FORMULA 1A Granulated and Brown* Sugar

INGREDIENTS	WEIGHT PERCENT
Acesulfame-K	.0015%
Aspartame™	.0015%
Lactitol	12%
Maltitiol	23.9056%
Inulin	50%
Improved polydextrose	10%
Fructose	4%
Simethicone	.0814%
Ethyl maltol	.01
TOTAL	100%

* Add Brown Sugar Flavoring to the invention according to Table # 4 when substituting for brown sugar.

NUTRITIONAL INFORMATION FOR FORMULA 1A

	FORMULA 1A	GRANULATED SUCROSE	LESS CALORIES
WEIGHT	100g.	100g.	
VOLUME-MEASURE	½ cup	½ cup	
CALORIES	169.7k cal	400k cal	57.5% less
TOTAL CARBOHYDRATES	96.5g.	100g.	
SUGAR	8.3g.*	100g.	
STARCH	0	0	
OTHER	45g.**	0	
DIETARY FIBER	43.2g.***	0	
% OF CALORIES FROM CARBOHYDRATES	19.6%	100%	

* Some samples of inulin contain less than the 8.6% simple sugars used.

** The carbohydrates listed under "other" do not need to be counted by diabetics as carbohydrates.

The "other" carbohydrates do not significantly raise the glucose and insulin levels in the blood when they are fermented. They have less than 4k cals per gram found in sugars and starches.

*** Solitary Dietary Fiber from inulin.

THE SYNERGISTIC COMPOSITION FOR ONE-TO-ONE REPLACEMENT OF POWDERED SUGAR

FORMULA 2 Powdered Sugar

INGREDIENTS	WEIGHT PERCENT
(same ingredients as formula 1 except in the powdered form)	(same weight percent as Formula 1)

The exception being that all granulated bulk sweeteners and sweeteners have to be in the powdered form for the proper mouth feel and texture.

NUTRITIONAL INFORMATION FOR FORMULA 2

	FORMULA 2	POWDERED SUGAR	LESS CALORIES
WEIGHT	120g.	120g.	
VOLUME-MEASURE	1 cup	1 cup	
CALORIES TOTAL	226.8k cal	466k cal	51.3% less
CARBOHYDRATES SUGAR	116.4g.	116.5g.	
STARCH	9.96g.*	116.5g.	
	0	0	
OTHER DIETARY	54.6g.	0	
FIBER	51.84g.***	0	
% OF CALORIES FROM CARBOHYDRATES	17.6%	100%	

* Some samples of inulin contain less than the 8.6% simple sugars used.

** The carbohydrates listed under "other" do not need to be counted by diabetics as carbohydrates.

The "other" carbohydrates do not significantly raise the glucose and insulin levels in the blood when they are fermented. They have less than 4k cals per grams found in sugars and starches.

*** Solitary Dietary Fiber from inulin.

FORMULA 2 Powdered Sugar

INGREDIENTS	WEIGHT PERCENT
(same ingredients as formula 1A except in the powdered form)	(same weight percent as Formula 1A)

NUTRITIONAL INFORMATION FOR FORMULA 2A

	FORMULA 2A	POWDERED SUGAR	LESS CALORIES
WEIGHT	120g.	120g.	
VOLUME-MEASURE	1 cup	1 cup	
CALORIES			
TOTAL	203.6k cal	466k cal	56.3% less
CARBOHYDRATES			
SUGAR	115.8g.	116.5g.	
STARCH	9.96g.*	116.5g.	
	0	0	
OTHER			
DIETARY	54g.**	0	
FIBER	51.84g.***	0	
% OF CALORIES			
FROM	19.6%	100%	
CARBOHYDRATES			

* Some batches of inulin have less than 8.6% simple sugars.

The 'other' carbohydrates are diabetic safe and do not need to be counted as the carbohydrates called sugar and starches. They do not significantly affect the glucose and

insulin levels of the blood. The "other" carbohydrate, when fermented in the large colon, have less than 4k cal per grams found in sugars and starches.

*** Solitary Dietary Fiber is from the inulin.

Examples 1-12

Each example is in three parts, i.e. A, B and C. "A" is an ingestible food made with regular sugar and fat. "B" is an ingestible food that the sugar has been replaced with one of the formula's of the present invention and labeled as a sugar substitute. "C" is an ingestible food where not only has the sugar been replaced with one of the formulas of the present invention, but also the fat was replaced with a 93% less fat than butter, one-to-one fat substitute. The low-fat substitute used in the examples has nutritional characteristics as follows in 100 grams of the product.

Product	Value
Calories	285
Total/Carbohydrates	57.5g
Sugar	0g
Starch	57.5g
Total Fat	5.94g
Saturated	3.92
Monosaturated	1.43
Polyunsaturated	.18g
Cholesterol	15mg
Sodium	356mg

The purpose of the examples is to show the reduction in sugar and calories using the present invention on its own compared to a high sugar example A., but when used in conjunction with a low fat substitute as in patent application 08/516,868 the reduction in

calories are very significant, i.e. close to 50% less, and the sugar reduction stays the same. The present invention can be used with a low fat substitute to show impressive calorie reduction plus significant sugar reduction.

To understand the following examples, please note the following:

1) The total carbohydrates equal all available carbohydrates. The figure in the parenthesis is the total carbohydrates a diabetic needs to count. The "other" carbohydrate is subtracted from the first figure in example 1 B. Butter Toffee/Formula 1 sugar substitute: Total Carb g. 2.6(.22) where 2.6g is the carbohydrate including the "other" and the (.22)g is the carbohydrate that a diabetic must count.

2) The Sugar figure is only the granulated, powdered, brown sugar or present invention known as Formula 1 and 1A and Formula 2 and 2A in the recipe. By figuring just these sugars and the present invention the comparisons are more direct. The simple sugars found in the other ingredients are not figured into the sugar grams only into the total carbohydrates.

EXAMPLES INGESTIBLE FOOD SUGAR AND FAT COMPARISONS

Example #1 A.

Butter Toffee/regular

1 cup butter
1cup granulated sugar
3 tbsp pecans, chopped

Nutritional Information

serving size	1/75
calories	33.7
fat g	2.6
total/carb g	2.7
sugar g	2.66
starch g	
other g	0
dietary fiber g	0

32% of total calories from sugar
82% of total calories from fat

B.

Butter Toffee/Formula 1 sugar substitute

1 cup butter
1 cup Formula 1 sugar substitute
3 tbsp pecans, chopped

Nutritional Information

serving size	1/75
calories	28.5
fat g	2.6
total/carb g	2.6(.22)
sugar g	.22
starch g	
other g	1.21
dietary fiber g	1.15

3% of total calories from sugar
82% of total calories from fat
15.4% less calories

C.

Butter Toffee/Formula 1 sugar substitute/low fat

1 cup low fat butter replacement
1 cup Formula 1 sugar substitute
3 tbsp pecans, chopped

Nutritional Information

serving size	1/75
calories	15.3
fat g	.04
total/carb g	4(1.64)
sugar g	.22
starch g	
other g	1.21
dietary fiber g	1.15

5.75% of total calories from sugar
2% of total calories from fat
54.5% less calories

Example #2
A.

Lemon Meringue pie/ regular

1 whole pie crust
1 1/2 cup granulated sugar
3 1/2 tbsp cornstarch
1 1/2 cup water
4 each egg yolks
1/2 cup lemon juice
3 tbsp butter
2 tbsp lemon peel

1/2 cup egg whites
1/4 tsp cream of tartar
1/2 cup granulated sugar
1/2 tsp vanilla

Nutritional Information

serving size	1/8
calories	368
fat g	12.9
total/carb g	65
sugar g	
starch g	
other g	
dietary fiber g	0.3

66% of total calories from sugar
29% of total calories from fat

B.

Lemon Meringue Pie/Formula 1 sugar substitute

1 whole pie crust
1 1/2 cup Formula 1 sugar substitute
3 1/2 tbsp cornstarch
1 1/2 cup water
4 each egg yolks
1/2 cup lemon juice
3 tbsp butter
2 tbsp lemon peel

1/2 cup egg whites
1/4 tsp cream of tartar
1/2 cup Formula 1/ sugar substitute
1/2 tsp vanilla

Nutritional Information

serving size	1/8
calories	278
fat g	12.9
total/carb g	64(19.7)
sugar g	4.15
starch g	
other g	22.75
dietary fiber g.	21.6

6% of total calories from sugar

29% of total calories
from fat
24% less calories

C.

Lemon Meringue Pie/ Formula 1
sugar subst/low fat

1 whole low fat pie crust
1 1/2 cup Formula 1 sugar substitute
3 1/2 tbsp cornstarch
1 1/2 cup water
4 each egg yolks
1/2 cup lemon juice
3 tbsp low fat substitute
2 tbsp lemon peel

1/2 cup egg whites
1/4 tsp cream of tartar
1/2 cup Formula 1/ sugar substitute
1/2 tsp vanilla

Nutritional Information

serving size	1/8
calories	216
fat g	1.2
total/carb g	73(28.65)
sugar g	4.15
starch g	
other g	22.75
dietary fiber g	21.6

8% of total calories from sugar
5% of total calories from fat
41% less calories

Example #3
A.

Apple Pie/regular

2 whole pie crusts
3/4 cup granulated sugar
1/4 cup flour
1/2 tsp nutmeg
1 tsp cinnamon
dash salt
6 cups apples sliced
2 tbsp butter

Nutritional Information

serving size	1/8
calories	363
fat g	15.4
total/carb g	(54.8)
sugar g	18.75
starch g	
other g	
dietary fiber g	

20% of total calories from sugar
38% of total calories from fat

B.

Apple Pie/Formula 1A
sugar substitute

2 whole pie crusts
3/4 cup Formula 1A/ sugar substitute
1/4 cup flour
1/2 tsp nutmeg
1 tsp cinnamon
dash salt
6 cups apples sliced
2 tbsp butter

Nutritional Information

serving size	1/8
calories	321
fat g	15.4
total/carb g	54.2(37.7)
sugar g	1.53
starch g	
other g	8.43
dietary fiber g	8.1

4% of total calories from sugar
43% of total calories from fat
11.5% less calories

C.

Apple Pie/Formula 1A
sugar substitute/low fat substitute

2 whole low fat pie crusts
3/4 cup Formula 1A/ sugar substitute
1/4 cup flour
1/2 tsp nutmeg
1 tsp cinnamon
dash salt
6 cups apples sliced
2 tbsp fat substitute

Nutritional Information

serving size	1/8
calories	175
fat g	1.3
total/carb g	49.7(33.17)
sugar g	1.53
starch g	
other g	8.43
dietary fiber g	8.1

3% of total calories from sugar
7% of total calories from fat
52% less calories

Example #4
A.

Sweet & Sour Chicken/regular

1/4 cup oil
4 cup chopped cooked chicken
1 large green pepper
1 large red pepper
1 large onion
1 cup water
2 tsp chicken bouillon
13 oz can pineapple chunks in juice (unsweetened)
2 tbsp soy sauce
2 tbsp cornstarch
1/4 cup vinegar
1/2 cup brown sugar

Nutritional Information

Serving size	1/4
calories	582
fat g	26.3
total/carb g	(43.5)
sugar g	25
starch g	
other g	
dietary	
fiber g	

17% of total calories from sugar
40% of total calories from fat

B.

Sweet & Sour Chicken/Formula 1

sugar substitute

1/4 cup oil
4 cup chopped cooked chicken
1 large green pepper
1 large red pepper
1 large onion
1 cup water
2 tsp chicken bouillon
13 oz can pineapple chunks in juice (unsweetened)
2 tbsp soy sauce
2 tbsp cornstarch
1/4 cup vinegar
1/2 cup Formula 1 sugar substitute
1/2 tsp brown sugar flavoring

Nutritional Information

Serving size	1/4
calories	532
fat g	26.3
total/carb g	50(27.83)
sugar g	2.07
starch g	
other g	11.37
dietary	
fiber g	10.8

1.5% of total calories from sugar
44% of total calories from fat
8.5% Less calories

C.

Sweet & Sour Chicken/Formula 1

sugar substitute/low fat

1/4 cup fat substitute
4 cup chopped cooked chicken
1 large green pepper
1 large red pepper
1 large onion
1 cup water
2 tsp chicken bouillon
13 oz can pineapple chunks in juice (unsweetened)
2 tbsp soy sauce
2 tbsp cornstarch
1/4 cup vinegar
1/2 cup Formula 1 sugar substitute
1/2 tsp brown sugar flavoring

Nutritional Information

Serving size	1/4
calories	293
fat g	2.2
total/carb g	53(30.83)
sugar g	2.07
starch g	
other g	11.37
dietary	
fiber g	10.8

2.8% of total calories from sugar
7% of total calories from fat
50% Less calories

Example #5

A.

Ranger Cookies/regular

1/2 cup margarine
2 large eggs
1/2 cup granulated sugar
1/2 cup brown sugar, packed
1 cup all-purpose flour
1/2 tsp baking powder
1/2 tsp baking soda
1/4 tsp salt
1 cup oats
1 cup corn flakes
1/4 cup coconut flakes

Nutritional Information

Serving size	1/36
calories	75
fat g	3.1
total/carb g	10
sugar g	5.5
starch g	
other g	
dietary	
fiber g	.3

40% of total calories from sugar
38% of total calories from fat

B.

Ranger Cookies/Formula 1 Sugar Substitute

1/2 cup margarine
2 large eggs
1/2 cup Formula 1 sugar substitute
1/2 cup Formula 1 sugar substitute
1/2 tsp brown sugar flavoring
1 cup all-purpose flour
1/2 tsp baking powder
1/2 tsp baking soda
1/4 tsp salt
1 cup oats
1 cup corn flakes
1/4 cup coconut flakes

Nutritional Information

Serving size	1/36
calories	63
fat g	3.1
total/carb g	9.9(4.98)
sugar g	.46
starch g	
other g	2.52
dietary	
fiber g	2.4

3% of total calories from sugar
44% of total calories from fat
16% less calories

C.

Ranger Cookies/Formula 1 Sugar Substitute/low fat

1/2 cup low fat butter replacement
2 large eggs
1/2 cup Formula 1 sugar substitute
1/2 cup Formula 1 sugar substitute
1/2 tsp brown sugar flavoring
1 cup all-purpose flour
1/2 tsp baking powder
1/2 tsp baking soda
1/4 tsp salt
1 cup oats
1 cup corn flakes
1/4 cup coconut flakes

Nutritional Information

Serving size	1/36
calories	47
fat g	.5
total/carb g	11.4(6.48)
sugar g	.46
starch g	
other g	2.52
dietary fiber g	2.4

4% of total calories from sugar
10% of total calories from fat
37% less calories

Example #6
A.

Sugar Cookies/regular

1 cup butter
2 large eggs
1 cup granulated sugar
3 1/2 cups all-purpose flour
1 tsp baking powder
1 tsp baking soda
1 tsp salt
2 tsp vanilla
1/2 cup milk

Nutritional Information

Serving size	1/60
calories	70
fat g	3.3
total/carb g	9
sugar g	3.3
starch g	
other g	
dietary fiber g	

19% of total calories from sugar
43% of total calories from fat

B.

Sugar Cookies/Formula 1A sugar substitute

1 cup butter
2 large eggs
1 cup Formula 1A sugar substitute
3 1/2 cups all-purpose flour
1 tsp baking powder
1 tsp baking soda
1 tsp salt
2 tsp vanilla
1/2 cup milk

Nutritional Information

Serving size	1/60
calories	63
fat g	3.4
total/carb g	8.9(46)
sugar g	.28
starch g	
other g	1.5
dietary fiber g	1.44

2% of total calories from sugar
47% of total calories from fat
10% less calories

C.

Sugar Cookies/Formula 1A sugar substitute/low fat

1 cup low fat butter replacement
2 large eggs
1 cup Formula 1A sugar substitute
3 1/2 cups all-purpose flour
1 tsp baking powder
1 tsp baking soda
1 tsp salt
2 tsp vanilla
1/2 cup milk

Nutritional Information

Serving size	1/60
calories	44.5
fat g	.3
total/carb g	10.8(7.86)
sugar g	.28
starch g	
other g	1.5
dietary fiber g	1.44

3% of total calories from sugar
6% of total calories from fat
36% less calories

Example #7
A.

Sugar Cookie Frosting/regular

1/4 cup butter
2 cups powdered sugar
2 tbsp milk
1 tsp vanilla

Nutritional Information

Serving size	1/48
calories	28
fat g	1
total/carb g	5
sugar g	5
starch g	
other g	
dietary fiber g	

71% of total calories from sugar
32% of total calories from fat

B.

Sugar Cookie Frosting/Formula 1A

sugar substitute

1/4 cup butter
2 cups Formula 1A powdered sugar substitute
2 tbsp milk
1 tsp vanilla

Nutritional Information

Serving size	1/48
calories	23
fat g	1
total/carb g	8(3.59)
sugar g	.41
starch g	
other g	2.25
dietary fiber g	2.16

7% of total calories from sugar
32% of total calories from fat
18% less calories

C.

Sugar Cookie Frosting/Formula 1A
sugar substitute/low fat

1/4 cup low fat butter replacement
2 cups Formula 1A powdered sugar substitute
2 tbsp milk
1 tsp vanilla

Nutritional Information

Serving size	1/48
calories	18
fat g	.1
total/carb g	9(4.59)
sugar g	.41
starch g	
other g	2.25
dietary fiber g	2.16

9% of total calories from sugar
5% of total calories from fat
35% less calories

Example #8
A.

Oatmeal Cake and Coconut Topping/regular

1/2 cup margarine
1 cup brown sugar
1 cup granulated sugar
2 large eggs
1 cup oats, quick
1 1/2 cup boiling water
1 1/2 cup all purpose flour
1/2 tsp salt
1 tsp vanilla
1 tsp cinnamon
1 tsp baking soda

1/4 cup margarine
2 tbsp milk
1 cup brown sugar
2 tbsp chopped nuts
1/4 cup coconut

Nutritional Information

Serving size	1/15
calories	294
fat g	11.3
total/carb g	46
sugar g	26
starch g	
other g	
dietary fiber g	

35% of total calories from sugar
34% of total calories from fat

B.

Oatmeal Cake and Coconut Topping/ Formula 1A s/sub.

1/2 cup margarine
1 cup Formula 1A s/sub.
1 tsp brown sugar flavoring
1 cup Formula 1A s/sub.
2 large eggs
1 cup oats, quick
1 1/2 cup boiling water
1 1/2 cup flour
1/2 tsp salt
1 tsp vanilla
1 tsp cinnamon
1 tsp baking soda

1/4 cup margarine
2 tbsp milk
1 cup Formula 1A s/sub.
1 tsp brown sugar flavoring
2 tbsp chopped nuts
1/4 cup coconut

Nutritional Information

Serving size	1/15
calories	237
fat g	11.3
total/carb g	52.5(28.98)
sugar g	2.4
starch g	
other g	12
dietary fiber g	11.52

4% of total calories from sugar
43% of total calories from fat
19% less calories

C.

Oatmeal Cake and Coconut Topping/ Formula 1A sugar/low fat

1/2 cup lowfat butter/sub.
1 cup Formula 1A s/sub.
1 tsp brown sugar flavoring
1 cup Formula 1A s/sub.
2 large eggs
1 cup oats, quick
1 1/2 cup boiling water
1 1/2 cup flour
1/2 tsp salt
1 tsp vanilla
1 tsp cinnamon
1 tsp baking soda

1/4 cup margarine
2 tbsp milk
1 cup Formula 1A s/sub.
1 tsp brown sugar flavoring
2 tbsp chopped nuts
1/4 cup coconut

Nutritional Information

Serving size	1/15

calories	196
fat g	.9
total/carb g	55(31.48)
sugar g	2.4
starch g	
other g	12
dietary	
fiber g	11.52

5% of total calories from sugar
4% of total calories from fat
33% less calories

Example #9

A.

Caramel Popcorn/regular

3/4 cup butter
3/4 cup brown sugar
3/4 cup granulated sugar
1/2 cup light corn syrup
1/4 tsp salt
1/2 cup water
1 tsp vinegar
10 cup popcorn, air-popped

Nutritional Information

Serving size	1/16
calories	185
fat g	8.8
total/carb g	28
sugar g	24
starch g	
other g	
dietary	
fiber g	

52% of total calories from sugar
43% of total calories from fat

B.

Caramel Popcorn/Formula 1 sugar substitute/corn syrup sub

3/4 cup butter
3/4 cup Formula 1 sugar substitute
3/4 tsp brown sugar flavoring
3/4 cup Formula 1 sugar substitute
1/2 cup corn syrup substitute
1/4 tsp salt
1/2 cup water
1 tsp vinegar
10 cup popcorn, air-popped

Nutritional Information

Serving size	1/16
calories	161
fat g	8.8
total/carb g	28(11.37)
sugar g	2.2
starch g	
other g	8.53
dietary	
fiber g	8.1

5% of total calories from sugar
49% of total calories from fat
13% less calories

C.

Caramel Popcorn/Formula 1 sugar substitute/corn syrup sub/low fat

3/4 cup low fat butter replacement
3/4 cup Formula 1 sugar substitute
3/4 tsp brown sugar flavoring
3/4 cup Formula 1 sugar substitute
1/2 cup corn syrup substitute
1/4 tsp salt
1/2 cup water
1 tsp vinegar
10 cup popcorn, air-popped

Nutritional Information

Serving size	1/16
calories	113
fat g	.8
total/carb g	35(18.37)
sugar g	2.2
starch g	
other g	8.53
dietary	
fiber g	8.1

9% of total calories from sugar
7% of total calories from fat
47% less calories

Example #10

A.

Tangy Coleslaw/regular

1 tbsp butter
2 tbsp flour
4 tbsp granulated sugar
1/4 tsp pepper
2 tbsp dijon mustard
1 1/2 cup chicken broth
1/2 cup vinegar
8 cups shredded cabbage
1/2 cup chopped onion

Nutritional Information

Serving size	1/9
calories	75
fat g	2.1
total/carb g	12
sugar g	5.5
starch g	
other g	
dietary	
fiber g	

29% of total calories from sugar
25% of total calories from fat

B.

Tangy Coleslaw/Formula 1A sugar substitute

1 tbsp butter
2 tbsp flour
4 tbsp Formula 1A sugar substitute
1/4 tsp pepper
2 tbsp dijon mustard
1 1/2 cup chicken broth
1/2 cup vinegar
8 cups shredded cabbage
1/2 cup chopped onion

Nutritional Information

Serving size	1/9
calories	63
fat g	2.1
total/carb g	12(7.1)
sugar g	.46
starch g	
other g	2.5
dietary	
fiber g	2.4

3% of total calories from sugar
29% of total calories
from fat
16% less calories

C.

Tangy Coleslaw/Formula 1A sugar substitute/low fat

1 tbsp low fat butter substitute
2 tbsp flour
4 tbsp Formula 1A sugar substitute
1/4 tsp pepper
2 tbsp dijon mustard
1 1/2 cup chicken broth
1/2 cup vinegar
8 cups shredded cabbage
1/2 cup chopped onion

Nutritional Information

Serving size	1/9
calories	57
fat g	.2
total/carb g	13(8.1)
sugar g	.46
starch g	
other g	2.5
dietary	
fiber g	2.4

3% of total calories from sugar
3% of total calories
from fat
24% less calories

Example #11
A.

Brown Sugared Carrots/regular

1/4 cup butter
1/2 cup brown sugar, packed
1 pound carrots

Nutritional Information

Serving size	1/4
calories	247
fat g	11.6
total/carb g	37
sugar g	25
starch g	
other g	
dietary	
fiber g	

40% of total calories from sugar
42% of total calories
from fat

B.

Brown Sugared Carrots/
Formula 1 sugar substitute

1/4 cup butter
1/2 cup Formula 1 sugar substitute
1/2 tsp brown sugar flavoring
1 pound carrots

Nutritional Information

Serving size	1/4
calories	191
fat g	11.6
total/carb g	35(12.83)
sugar g	2
starch g	
other g	11.37
dietary	
fiber g	10.8

4% of total calories from sugar
54% of total calories
from fat
23% less calories

C.

Brown Sugared Carrots/
Formula 1 sugar substitute/low fat

1/4 cup low fat butter replacement
1/2 cup Formula 1 sugar substitute
1/2 tsp brown sugar flavoring
1 pound carrots

Nutritional Information

Serving size	1/4
calories	135
fat g	1.1
total/carb g	43(20.83)
sugar g	2
starch g	
other g	11.37
dietary	
fiber g	10.8

6% of total calories from sugar
7% of total calories
from fat
45% less calories

Example #12
A.

lemonade/regular

3 cups water
1 cup lemon juice(about 4 lemons)
1/2 cup granulated sugar

Nutritional Information

Serving size	1/4
calories	112
fat g	0
total/carb g	30
sugar g	25
starch g	
other g	
dietary	
fiber g	

89% of total calories from sugar
0% of total calories
from fat

B.

lemonade/Formula 1
sugar substitute

3 cups water
1 cup lemon juice(about 4 lemons)
1/2 cup Formula 1 sugar substitute

Nutritional Information

Serving size	**1/4**
calories	**63**
fat g	**0**
total/carb g	**30(7.83)**
sugar g	**2**
starch g	
other g	**11.37**
dietary	
fiber g	**10.8**

13% of total calories from sugar
0% of total calories from fat

While the present invention is described by reference to specific embodiments, it will be apparent that other alternative embodiments and methods of implementation or modification may be employed without departing from the true spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. A low calorie, diabetic safe, water soluble, synergistic sweetening composition in whole as a one-to-one for granulated sugars, brown sugars, and powdered sugars for sweetening ingestible food, the composition comprising:

(a) one or more intense sweeteners at a level from about 0.001 to about 8% by weight of the composition;

(b) two or more bulk sweeteners as at a level from about 0.5 to about 99% by weight of the composition;

(c) one or more sweeteners present in the present invention at a level from about 1 to about 15% by weight of the composition;

(d) one or more anti-flatulent agents at a level from about .001 to about 5% by weight of the composition;

(e) one or more flavoring agents at a level from about .0001 to about 5 by weight of the composition.

2. The composition of claim 1 wherein the intense sweeteners are selected from the group consisting of aspartame, acesulfame-K, thaumatin, talin, arabic gum, saccharin, cyclamate, stevioside, glycyrrhizin, dihydrochalcones, monellin, chlorodeoxygalactosucrose derivatives, licorice extract, or mixtures thereof.

3. The composition of claim 1 wherein the bulk sweeteners are selected from the group consisting of the groups including inulin, branched inulin, linear fructo-oligosaccharides, branched fructo-oligosaccharides, lactitol, maltitol, mannitol,

sorbitol, erythritol, galactitol, isomaltulose, polyglucose, polymaltose, carboxymethylcellulose, carboxyethylcellulose, arabinogalactan, microcrystalline cellulose, polydextrose, palatinit, indigestible dextrins, or mixtures thereof.

4. The composition of claim 3 wherein one of the bulk sweeteners is inulin.

5. The composition of claim 3 wherein the bulk sweeteners are crystallized, granulated, powdered, or mixtures thereof.

6. The composition of claim 1 wherein the sweeteners are selected from the group consisting of fructose, glucose, sucrose, and mixtures thereof.

7. The composition of claim 6 wherein the sweeteners are crystalline, powdered, or mixtures thereof.

8. The composition of claim 1 wherein the anti-flatulent agents are selected from the group consisting of lactobacillus acidophilus culture, yucca schidigera extract, simethicone, or mixtures thereof.

9. The composition of claim 1 wherein the flavoring agent is ethyl malto.

10. The composition of claim 1 wherein synergistic sweetening composition is a one-to-one substitution for brown sugars.

11. The composition of claim 10 wherein said flavoring agents are natural brown sugar and molasses flavoring or mixtures thereof.

12. The composition of claim 11 wherein the brown sugar molasses flavoring, or mixture thereof is used to replace brown sugars in ingestible food compositions.

13. The composition of claim 1 wherein the synergistic sweetening composition is in whole a one-to-one substitute for powdered sugars.

14. The composition of claim 15 wherein the bulk sweeteners are powdered.

15. The composition of claim 15 wherein the sweeteners are powdered.

16. The composition of claim 1 wherein the caloric content is at least one half the calories of sucrose.

17. The composition of claim 1 is in whole a one-to-one substitution for sugar by volume measurement and by weight measurements.

18. The composition of claim 21 wherein the ingestible foods include beverages, confectioneries, chocolates and candies; bakery products; main dishes, side dishes, and soups; desserts; pharmaceutical products; salad dressings; frozen confectionery products; dairy products; oral hygiene products; jams and jellies; but not limited thereof.

19. a method for manufacturing a synergistic sweetening composition comprising:

(a) preparing a diluted mixture of intense sweeteners and water at a correct strength needed for the composition;

(b) spraying the diluted mixture over bulk sweeteners;

(c) drying the above mixture;

(d) mixing the bulk sweeteners and intense sweeteners in a drum mixer for about 20 minutes until completely dispersed;

(e) adding the intense sweeteners, adding the flavor enhancer, and the anti-flatulent agent to the bulk sweeteners and intense sweeteners and mixing until completely dispersed;

(f) pouring the finished mixture into air-tight packaging and sealing.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/13526

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A23L 1/236
US CL :426/548

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/548, 061, 658

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2,629,665 A (GORDON) 24 February 1953, entire document.	1-19
Y	US 4,001,456 A (GLICKSMAN ET AL) 04 January 1977, entire document.	1-19
Y	US 5,064,658 A (CHERUKURI ET AL) 12 November 1991, entire document.	1-19

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"B"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
02 OCTOBER 1997	12 NOV 1997

Name and mailing address of the ISA/US	Authorized officer
Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	LESLIE WONG
Facsimile No. (703) 305-3230	Telephone No. (703) 308-1979

Form PCT/ISA/210 (second sheet)(July 1992)★